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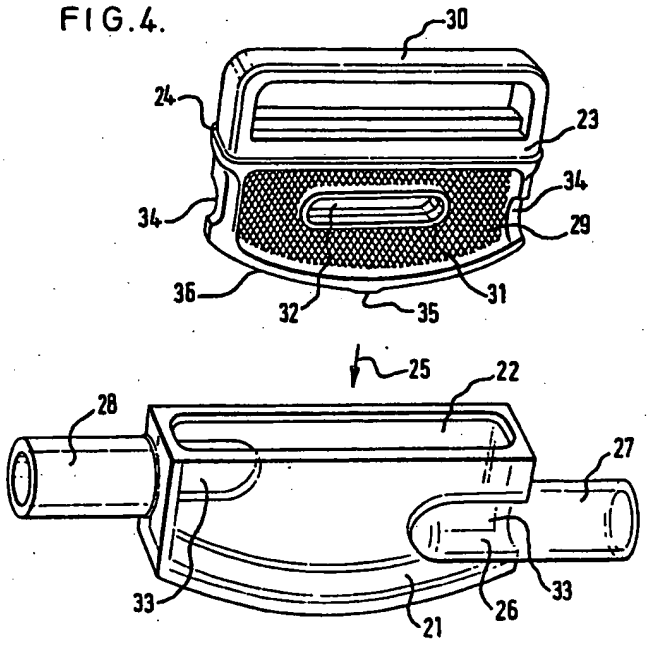
(54) Demountable filters for liquid flow lines

(57) A demountable filter for milking plant comprises a hollow housing 21 with a slot to receive a slide member 23 carrying a filter element 29, the slide member being self-sealing in the housing when fitted in the slot. The slide member may be provided with a circumferential O-ring for sealing with the whole of the slot face in one cross-sectional plane of the slot, or it may be provided with O-ring seals on two faces for engaging the sides of the slot. A by-pass channel 32 may be provided past the filter element so that the flow line is not obstructed if the filter element becomes clogged. The housing may be transparent, and the filter element is inspected for clots to detect mastitis in a cow connected to the plant.

FIG.4.



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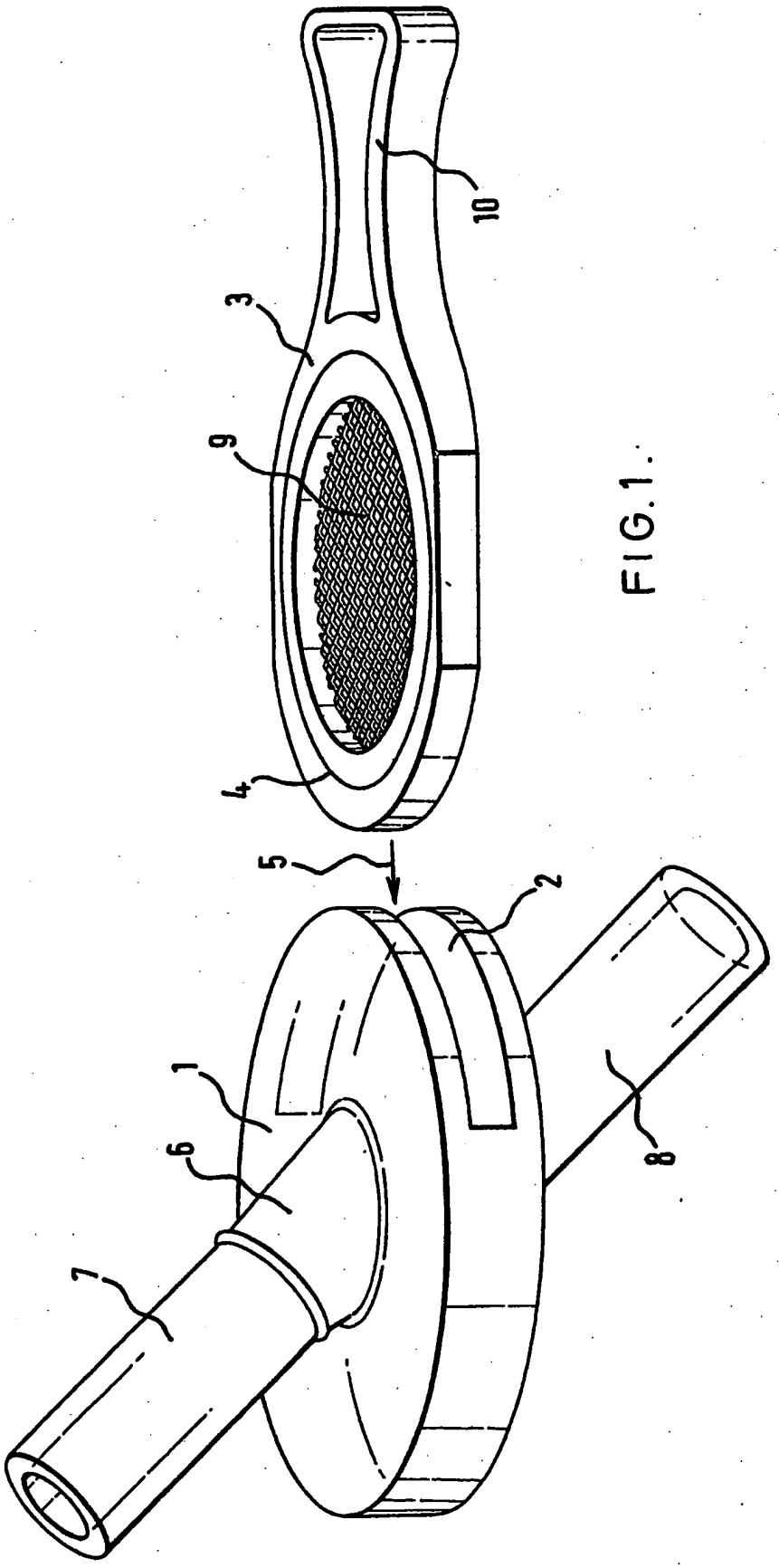

FIG.1.

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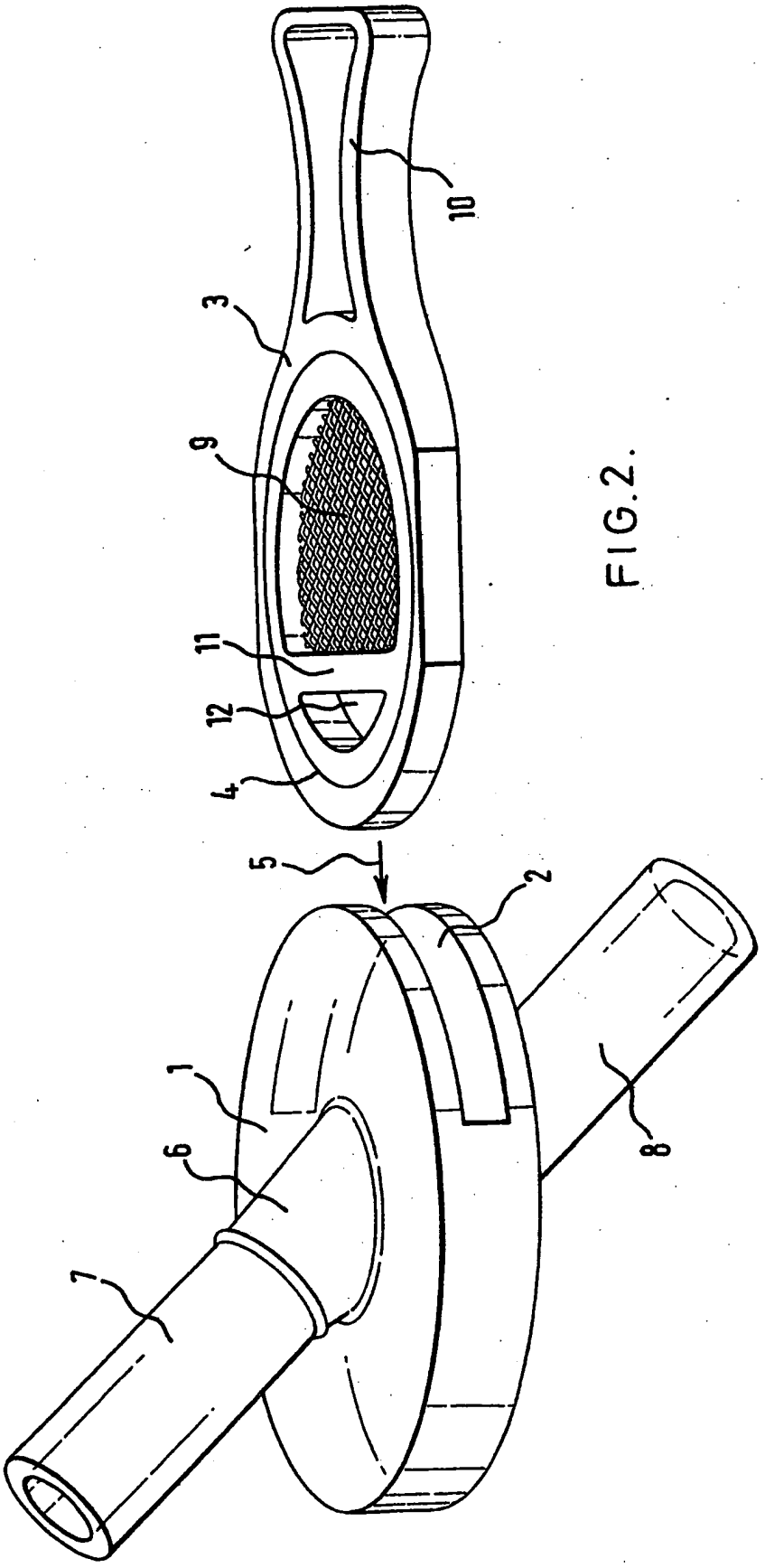

FIG.2.

FIG. 3.

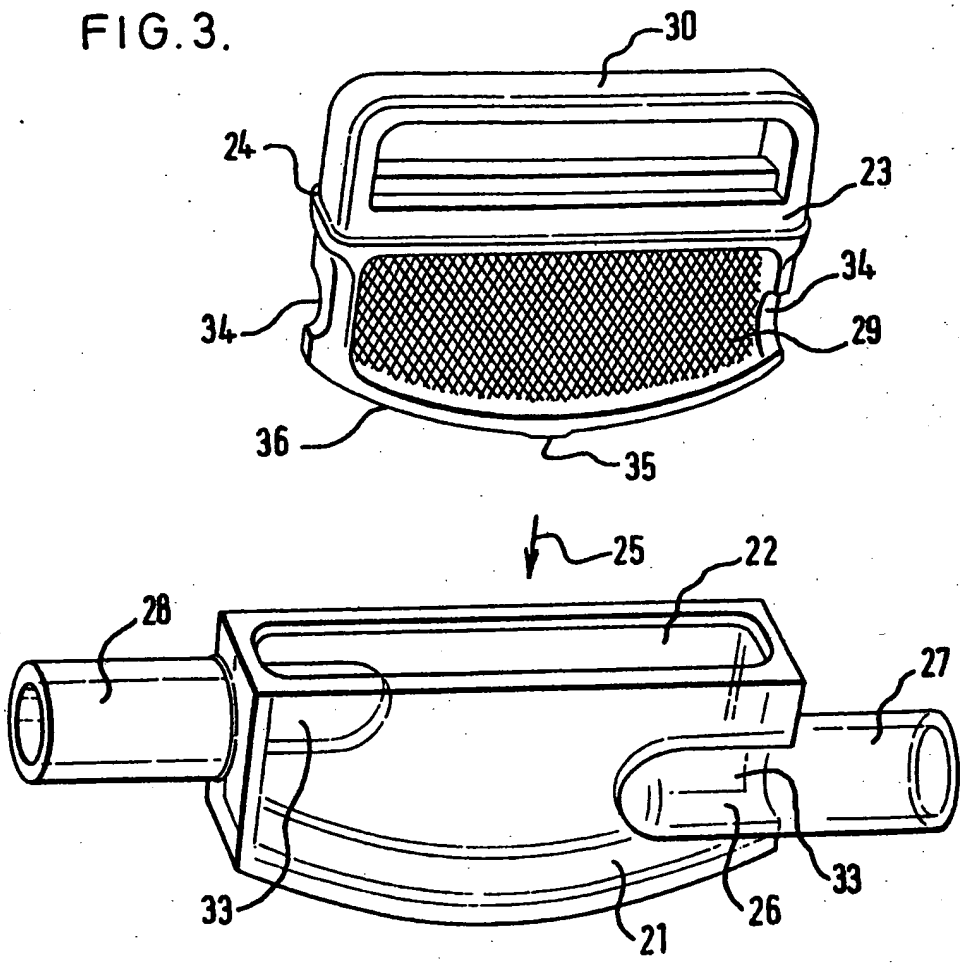

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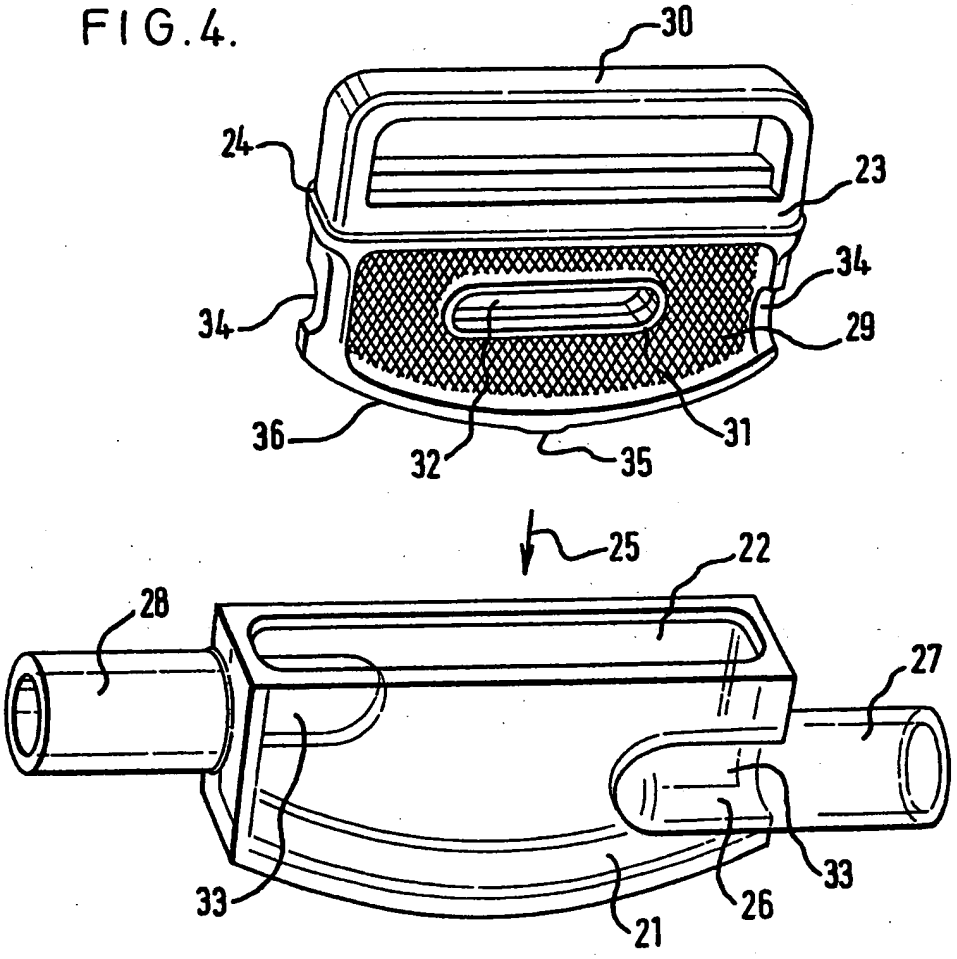
FIG.4.



SPECIFICATION

Improvements in or relating to demountable filters for liquid flow lines

BACKGROUND OF THE INVENTION

This invention relate generally to demountable filters for liquid flow lines and particularly to a demountable filter for the detection of mastitis in cows. In this use of the invention the filter is fitted in the milk flow line of a milking installation and serves to detect the presence of milk clots, which characterize the milk from a cow suffering from mastitis. A separate filter is used for each station of the milking installation so that the milk from each cow is separately monitored.

Demountable filters are known which involve opening the filter body for the removal, or inspection, of the filter element. It is an object of the present invention to provide a filter in which the filter element is carried in a slide which can be withdrawn from the filter body without otherwise dismantling the filter and can be replaced therein, the filter slide member being self-sealing when so replaced.

SUMMARY OF THE INVENTION

Accordingly, the most general form of the invention provides a demountable filter for a liquid flow line comprising a hollow body with a slot to receive a slide member carrying a filter element, the slide member being self-sealing in the body part when fitted in the body slot.

In one example of a demountable filter of this type, a body part of flat circular shape has a lateral slot to receive the slide member. The slide member is provided with O-ring seals on its top and bottom faces and the slot is tapered inwardly so that the slide member is self-sealing in the body part when fitted in the body slot.

In another example, a demountable filter for a liquid flow line comprises a hollow body with a slot to receive a slide member carrying a filter element having a circumferential O-ring, for sealing with the whole of the slot face in one cross-sectional plane of the slot, fitted around the slide member.

With dairy herds, the avoidance of mastitis requires continual inspection. There are tests which indicate the presence of mastitis before this condition produces clots in the milk taken from an animal. However, the presence of clots in milk are one indication of mastitis and an indication which can readily be continuously monitored during milking. One form of the invention provides a filter for the detection of milk clots when milking. A separate such filter is used for each beast being milked, so that the source of any milk clots is evident. This form of filter is provided with a filter element by-pass aperture, so that the milking line is not blocked and the vacuum lost, should the filter element itself become blocked by milk clots.

The invention also includes a method of detecting milk clots comprising causing milk to flow through a flow line by applying a vacuum thereto, said flow line having fitted therein a demountable filter according to the invention set out above and inspecting said filter element for milk clots which might be retained thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a demountable filter, the two parts thereof being shown separated;

Figure 2 is a corresponding view of the form of filter for use as a mastitis detector in milking;

Figure 3 is a perspective view of a demountable filter for use in a liquid flow line, the body and filter slide parts thereof being shown separated; and

Figure 4 is a corresponding view of the form of filter for use as a mastitis detector in milking.

DETAILED DESCRIPTION OF THE INVENTION

In Figures 1 and 2, wherein like elements are indicated by the same reference numerals in the two figures, the filter comprises a flat, circular, hollow filter body 1 having a slot 2 at one side to receive a filter slide-member 3. The slide member 3 is inserted into the slot 2 of the body 1 in the direction of the arrow 5. The slot 2 has its upper and lower faces tapered inwardly and the slide member 3 is self-sealing when inserted therein by the provision of "O"-rings in the top and bottom faces of the slide member 3, the top "O"-ring being shown at 4. Both "O"-rings are secured in the slide faces by being recessed into and retained by circular grooves.

The filter body 1 is made of transparent plastics material, so that the filter element can be inspected when the slide is in its assembled position.

The filter body 1 has oppositely-angled collars in its top and bottom faces to receive inlet and outlet pipes 7 and 8, respectively.

The slide member 3 is shaped as a circular ring, retaining the filter element 9, and having an offset handle 10, by which the slide member 3 is inserted into and removed from the filter body 1.

In the general form of the filter shown in Figure 1, the nature of the filter element 9 depends upon the use of the filter and may be wire-mesh coated or uncoated perforated or expanded sheet or an expendable element retained in a carrier. In the embodiment illustrated, the filter element 9 is wire-mesh. Plastics mesh may also be used.

In the embodiment illustrated in Figure 2, intended for use as a mastitis detector, the circular aperture of the slide member 3 is divided by a bridge 11 to leave a by-pass aperture 12.

In the embodiment of Figure 2, the body 1 is made of clear, nylon plastics material and is transparent. The slide 3 is made of resin material such as PPO or ABS.

The body 1 is some 85mm length between the ends of the inlet and outlet pipes and some 65mm overall diameter. The milk line inlet and outlet pipes 8 and 7 are 18mm diameter.

The filter element 9 is P.T.F.E.-coated stainless steel wire-mesh some 11 square centimetres in area with an aperture size of some 150 microns. The area of the by-pass aperture 12 equals the cross-section area of the milking line. The "O"-rings 4 are of nitrile material.

In use, the milk line at each station of a conventional milking installation is cut, after the claw and towards the recorder jar. The filter of Figure 2 is inserted by drawing the cut ends of the milk line onto the pipes 7 and 8, so that milk flow ingresses through pipe 7 and egresses through pipe 8. With the slide 3 inserted, the filter element 9 is visible through the transparent filter body 1, at the clear part to the right of the collar 6, as viewed in Figure 2.

Due to the P.T.F.E. coating, the filter element 9 is of black appearance and milk clots can be readily detected. If the filter mesh area becomes completely clogged, and particularly under this condition, the milk flows through the by-pass aperture 12, so that the milk line is not blocked by the clogged filter element. Because of the by-pass aperture 12, neither the cow nor the milking process are affected by clogging of the filter element and, in particular, the teat cups do not fall off the cow due to loss of suction.

A separate filter according to Figure 2 is used at each milking station of the milking installation. The presence of milk clots in the filter is thus uniquely associated with the particular cow at the corresponding station.

In Figures 3 and 4, wherein like elements are indicated by the same reference numerals in the two figures, the filter comprises a flat, hollow filter body 21 having a slot 22 to receive a filter slide-member 23. In the views of Figures 3 and 4, the slot 22 is uppermost. The slide member 23 shown above the body 21 in both figures, inserted downwardly, as shown by the arrow 25.

The slide member 23 has an "O"-ring 24 located in a slot and extending around the slide member 23 so that when the slide 23 is inserted in the slot 22, the "O"-ring 24 seals with the whole of the slot inner face in one cross-sectional plane of the slot.

The filter body 21 is made of transparent plastics material, so that the filter element can be inspected when the slide 23 is assembled therewith.

The filter body 22 has stub pipes 27 and 28 for attachment to the flexible hose of a liquid flow line, so that the filter can be readily inserted in the flow line. The stub pipes 27 and 28 connect into opposite sides of the body 21 so that connection between them is through the filter element. The stub pipes 27 and 28 are not on a common axis, but each is offset towards its respective side providing an overlap portion as at 26 for pipe 27. This feature is discussed more fully later herein.

The description so far relates to both embodiments of Figures 3 and 4.

Referring to Figure 3, it will be seen that the filter embodiment has an internal part comprising a generally rectangular frame into which the filter element 29 is moulded. The nature of the filter element 29 depends upon the use of the filter. It may be wire mesh, P.T.F.E.-coated or uncoated, plastics mesh or expanded matal.

As an alternative to the filter element 29 being moulded into the surrounding frame, the filter element may be retained in a mount which can be fitted into and removed from the frame.

The slide 23 has a lengthwise handle 30, by which the slide is inserted into and removed from the slot 22, which protrudes from the slot 22 above the "O"-ring 24 when the slide 23 and body 22 are assembled.

At the ends of the stub pipes 27 and 28, the frame of slide 23 is cut away at 34 to afford a free passage towards and away from the filter element 29, of about the same cross-sectional area as the stub pipes 27 and 28 themselves. Also the extensions 33 of the stub pipes 27 and 28 extent the liquid flow along the flow line in which it is connected.

The slide frame has a stop 35 moulded integrally therewith which abuts the inside of the lower curved surface of the body 21, as seen in the figures. At the sides of the stop 35, the face 36 of the frame is cut away to afford a narrow passage between the slide frame and the body. The effect of this construction is explained with reference to the embodiment of Figure 4.

As will be readily understood, the filter element 29 of the general filter embodiment of Figure 3 will collect sediment on its up-stream face and the dirty slide 23 may be readily removed from the body 21, for the cleaning of the filter element 29 or the replacement of the slide, with only short interruption of liquid flow through the line.

Referring now to the mastitis detector of Figure 4, it will be seen that the slide 23 filter element 29 has a central elongated by-pass aperture provided by an inner frame 31 moulded integrally with the slide 23. The height of the walls of frame 31, determining a circumferential gap with the inner faces of the slot 22, are such that the gap area corresponds approximately to the area of the stub pipes 27 and 28 and the cross-sectional area of the by-pass aperture 32 is also approximately equal. Thus, the stub pipe internal bore, the inlet apertures at 33, 34 and at 26, the gaps on each side of the by-pass frame 31 and the by-pass aperture 32 are all of approximately the same cross-sectional area. In use, the filter of Figure 4 is inserted in the milk flow line of a milking installation. Any milk clots collect on the up-stream face of the filter element 29. However, even should the face of the filter become clogged, the proportioning of the filter apertures and by-pass described above ensure that the milk flow is not restricted. Nor is the milking line vacuum reduced which might otherwise result in teat cups becoming detached from the beast being milked.

A separate filter according to Figure 4 is used at each station of the milking installation. The presence of clots in the filter is thus uniquely associated with the particular beast at the corresponding station.

The preferred filter medium 29 for the mastitis detector of Figure 4 is expanded metal. This material has a preferred orientation. As may be seen from visual inspection obliquely through the material, in one orientation the lands of metal obscure the view through the material whereas, in the orientation at 180°, the view is obscured only by the edges of the metal lands. The expanded metal element is moulded in the slide so that the oblique liquid flow through the element is in the unobscured orientation as above described. This orientation ensures that clots are carried into and held by the filter element face and not washed along it and carried through the by-pass aperture. The wall 31 around the by-pass aperture 32 further prevents milk clots being washed through.

It will be seen that, with the moulding of the expanded metal filter medium into the slide 32, the orientation is fixed and is correct regardless of the up-stream face presented by the sense in which the slide 23 is inserted in the slot 22 and is also correct regardless of reversal of the filter, pipe 27 for pipe 28, in the milk line.

The foregoing description referred to the stop 35 and the seepage passage 36 between the slide 23 and the slot 22 inner curved face. When the milk line is washed out after milking, the filter is washed at the same time. The seepage passage 36 ensures that no crevices remain between the two filter parts where the cleaning fluid cannot reach.

Further, the wall of the slide frame is tapered away from the slot 22 inner surface immediately adjacent to the groove retaining the "O"-ring 24. This feature avoids the creation of a crevice condition at the inside face of the "O"-ring seal which would prevent effective cleaning during washing out of the milk line.

The seepage passage 36 may be achieved without the stop 35 being present. For example, the slide 23 may be formed with a shoulder (not shown) above the ring 24 which engages the body 21 when the slide 23 is separated from the end of the slot 22 by the required width of the seepage passage 36.

Although O-ring seals 4 and 24 have been described, any suitable seal may be used. The slide 3 and 23 may be made of sealing material themselves, so that no separate seal is then required, the slide 3 and 23 forming a seal with the body 1 and 21 on engagement therewith.

CLAIMS

1. A demountable filter for a liquid flow line comprising a hollow body formed with a slot, the filter further comprising a slide member carrying a filter element for said liquid flow line and sealing means, the arrangement of the sealing means being such that the slide member is self-sealing in the body when fitted in said slot.

2. A filter according to Claim 1 wherein said sealing means comprises a ring seal arranged to seal with the whole of the slot face in one cross-sectional plane of the slot.

3. A filter according to Claim 1 wherein said sealing means comprises a pair of ring seals arranged respectively on opposite faces of the slide member.

4. A filter according to Claim 1 wherein said slot member when fitted in said slot is constructed to provide a by-pass channel in parallel with liquid flow through said filter element.

5. A filter according to Claim 4 wherein said by-pass channel is wholly defined by said slide member.

6. A filter according to Claim 5 wherein said by-pass channel is encircled by said filter element.

7. A filter according to Claim 1 wherein said hollow body is formed with an inlet conduit and an outlet conduit and wherein said filter element is formed from expanded sheet material, the lands of the filter element observing the direct lie joining said conduits.

8. A filter according to Claim 1 wherein said hollow body is transparent to allow observation of said filter element.

9. A filter according to Claim 4 wherein said hollow body is formed with an inlet conduit and an outlet conduit, said conduits and said channel having equal cross sections.

10. A method of detecting milk clots comprising causing milk to flow through a flow line by applying a vacuum thereto, said flow line having fitted therein a demountable filter as claimed in Claim 1 and inspecting said filter element for milk clots which might be retained thereon.

New claims or amendments to claims filed on 19 Nov 1979
Superseded claims 1, 7, 8, 9, 10
New or amended claims:—

CLAIMS

1. A demountable filter for a liquid flow line, comprising a hollow body formed with a slot, a slide member carrying a plane filter element for fitting into said slot, sealing means such that the slide member is self-sealing in the filter body when fitted into said slot, said body being transparent at least in a part through which the filter element can be viewed, and the body being provided with a liquid inlet conduit and a liquid outlet conduit the axes of both of which are oblique to the plane of the filter element, to facilitate viewing of the filter element within the filter body.

7. A filter according to Claim 1 wherein said filter element is formed from expanded sheet material, the lands of the filter element observing the axial lines of said conduits.

8. A filter according to Claim 4 wherein said hollow body is formed with an inlet conduit and an outlet conduit, said conduits and said channel having equal cross sections.

9. A method of detecting milk clots comprising causing milk to flow through a flow line by applying a vacuum thereto, said flow line having fitted therein a demountable filter with a

transparent body housing a filter element as claimed in Claim 1 and inspecting said filter element when housed in the transparent body for milk clots which might be retained thereon.

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